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LICENSED FUEL FACILITY STATUS REPORT

INVENTORY DIFFERENCE DATA
JULY 1981 - DECEMBER 1981

UNITED STATES NUCLEAR REGULATORY COMMISSION

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INVENTORY DIFFERENCE DATA
JULY 1981 - DECEMBER 1981

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U.S. NUCLEAR REGULATORY COMMISSION
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ABSTRACT

NRC is committed to the periodic publication of licensed fuel facilities inventory difference data, following agency review of the information and completion of any related investigations. Information in this report includes inventory difference data for active fuel fabrication facilities possessing more than one effective kilogram of high enriched uranium, low enriched uranium, plutonium, or uranium-233.

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ABBREVIATIONS

CFR	Code of Federal Regulations
HEU	High Enriched Uranium
ID	Inventory Difference
LEID	Limit of Error of the Inventory Difference
LEMUF	Limit of Error of Material Unaccounted For
LEU	Low Enriched Uranium
MUF	Material Unaccounted For
NRC	U.S. Nuclear Regulatory Commission
SNM	Special Nuclear Material
S-R	Shipper-Receiver

LICENSED FUEL FACILITY STATUS REPORT
INVENTORY DIFFERENCE DATA

Inventory Difference Data

An inventory difference (ID), also referred to as material unaccounted for (MUF), is the difference between the quantity of special nuclear material that a licensee's accounting records show should be on hand and that which a licensee's physical inventory shows is actually on hand.

The inventory difference data presented are for active, licensed facilities that are authorized to possess, in an unsealed form, at least one effective kilogram of special nuclear material (that is, high enriched uranium, plutonium, and uranium-233) or at least one effective kilogram of low enriched uranium (for example, material used in commercial nuclear power reactors). The U. S. Nuclear Regulatory Commission (NRC) requires licensees possessing significant quantities of high enriched uranium, plutonium, or uranium-233 to conduct an inventory every 2 months. Licensees possessing one effective kilogram of low enriched uranium are required to inventory every 6 months, except for General Electric Co., Wilmington, N.C., which is required to inventory every 12 months.

It is important to understand the distinction between the low strategic value of low enriched uranium and the higher strategic value of high enriched uranium and plutonium. Most low enriched uranium (the nuclear fuel for commercial light-water power reactors) is enriched to a level of 1 to 4 percent in the isotope uranium-235. At this level of enrichment, the uranium is not capable of sustaining the kind of nuclear reaction that takes place in a nuclear explosion.

NRC safeguards requirements covering low enriched uranium are graded to reflect its low strategic value. They include a formal structured system for material control and accounting and, in accordance with recent revisions to 10 CFR 73, minimal physical security measures. On the other hand, because of the higher strategic importance of significant quantities of high enriched uranium and plutonium, NRC requires licensees to provide substantial physical protection of this material in addition to controlling and accounting for it. Physical protection of this material includes safeguards measures such as barriers, intrusion alarms, armed guards, and offsite police response capabilities. Internal systems to control the movement of this nuclear material are also required by NRC.

Inventory differences arise when nuclear materials are processed (particularly when chemical operations are involved). These differences can result from variations in measuring and processing, measurement inaccuracy or imprecision, unmeasured flows from the process, unmeasured inventory, bookkeeping errors, or loss or theft. Although an inventory difference larger than its overall measurement uncertainty (limit of error) may signal an abnormal situation

requiring determination of cause, the fact that an inventory difference falls within its associated limit of error--even an inventory difference of zero--provides no automatic or conclusive proof that loss or theft of material has not occurred.Therefore, NRC relies on information provided not only by the material accounting system but also by the internal control system, the physical security system, NRC inspections and evaluations, and NRC and licensee investigations.

A method that licensees and NRC currently use to determine the signifance of the inventory difference is a concept called LEID, or limit of error of the inventory difference. LEID is a calculated estimate of the measurement uncertainties that are associated with a plant's processing activity. The inventory difference theoretically should be less than LEID 19 out of 20 times, if the inventory difference results only from measurement uncertainty.

Because an inventory difference that exceeds its associated LEID may be an indication of processing problems, biased or otherwise inaccurate measurements, bookkeeping errors, or loss or theft of material, NRC accordingly requires licensees to take increasingly stronger investigative actions depending on how much the inventory difference exceeds LEID. Two inventory differences exceeded their LEID during the period of this report (July 1, 1981 through December 31, 1981). In both cases that the inventory difference exceeded the criteria of 10 CFR 70.53(b)(1), the licensee forwarded to NRC a statement of the probable reasons for the ID and the actions taken or planned with respect to the ID. Each such statement has been reviewed by NRC. Inventory data for Rockwell were inadvertently omitted from the last volume. The inventory data for January 1, 1981 through June 30, 1981, are included in this volume. In certain instances in the past, NRC has independently conducted investigations of an excessive ID. These investigations have not established that significant quantities of special nuclear material have been stolen. For each inventory difference noted in this report, there is an evaluation of the data and, where appropriate, the cause or causes of the inventory difference have been identified.

Definitions of Terms

1. Effective Kilogram of Special Nuclear Material: (1) For plutonium and uranium-233, their weight in kilograms; (2) for uranium with an enrichment in the isotope uranium-235 of 0.01 (1%) and above, its element weight in kilograms multiplied by the square of its enrichment expressed as a decimal weight fraction; and (3) for uranium with an enrichment in the isotope uranium-235 below 0.01 (1%), its element weight in kilograms multiplied by 0.0001.

2. High Enriched Uranium (HEU): Uranium whose isotope content is 20 percent or more uranium-235 by weight.

3. Inventory Difference (ID): The arithmetic difference between a book inventory and the corresponding physical inventory, calculated by subtracting ending inventory (EI) plus removals (R) from beginning inventory (BI) plus additions (A). Mathematically, this becomes

$$ID = (BI + A) - (EI + R).$$

4. Isotope: One of several different atoms of a particular element, that has the same number of protons in its nuclei, has the same atomic number, but differs in the number of neutrons and in the mass number.

5. Limit of Error: The uncertainty component used in constructing a 95 percent confidence interval associated with a quantity after any recognized bias has been eliminated or its effect accounted for.

6. Limit of Error of the Inventory Difference (LEID): That limit of error associated with the inventory difference after the material balance data has been adjusted for any recognized bias (same as limit of error of material unaccounted for [LEMUF]).

7. "The inventory difference is within the regulatory limit": The ID does not exceed both a minimum quantity specified by the regulations and its associated limit of error of the inventory difference (LEID).

8. Low Enriched Uranium (LEU): Uranium whose isotope content is less than 20 percent uranium-235 by weight.

9. Negative Inventory Difference: A situation that occurs when the amount of material on hand, as determined by physical inventory, exceeds the amount of material being carried on the books (that is, there appears to be a gain of material). Mathematically, a negative ID is written as -ID. A negative ID is also referred to an an "ID gain."

10. Positive inventory difference: A situation that occurs when the amount of material on hand, as determined by physical inventory, is less than the amount of material being carried on the books (that is, there appears to be a loss of material). Mathematically, a positive ID is written as +ID or ID (without designation of sign). A positive ID is also referred to as an "ID loss".

11. Shipper-receiver difference (S-R difference): The arithmetic difference between the quantity of special nuclear material measured by the shipper and the quantity measured by the receiver.

12. Special nuclear material (SNM): (1) Plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the Commission, pursuant to the provisions of Section 51 of the Atomic Energy Act of 1954, as amended, determined to be special nuclear material, but does not include source material; or (2) any material artificially enriched in any of the foregoing, but does not include source material.

13. Strategic special nuclear material: Uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope), uranium-233, or plutonium.

Tabulation of Inventory Differences

Licensee	License No.	Material Type	Inventory Date	Inventory Difference (Grams U-235)	Explanation
Babcock & Wilcox Navy, Lynchburg, VA	SNM-42	HEU	08/31/81	1,906	The inventory difference falls within the applicable regulatory limit.
		HEU	10/31/81	915	The inventory difference falls within the applicable regulatory limit.
		HEU	12/31/81	-378	The inventory difference falls within the applicable regulatory limit.
Babcock & Wilcox Apollo, PA	SNM-145	LEU	12/29/81	-700	The inventory difference falls within the applicable regulatory limit.
Babcock & Wilcox Lynchburg Research Center, VA	SNM-778	LEU	10/31/81	139	The inventory difference falls within the applicable regulatory limit.
Babcock & Wilcox, CNFP, Lynchburg, VA	SNM-1168	LEU	07/01/81	-5,769	The inventory difference falls within the applicable regulatory limit.
Combustion Engineering, Hematite, MO	SNM-33	LEU	07/20/81	-624	The inventory difference falls within the applicable regulatory limit.
Combustion Engineering, Windsor, CN	SNM-1067	LEU	10/29/81	6,162	The inventory difference falls within the applicable regulatory limit.
Exxon, Richland, WA	SNM-1227	LEU	09/30/81	-414	The inventory difference falls within the applicable regulatory limit.

Licensee	License No.	Material Type	Inventory Date	Inventory Difference (Grams U-235)	Explanation
General Atomic, LaJolla, CA	SNM-696	LEU	09/21/81	216	The inventory difference falls within the applicable regulatory limit.
		HEU	07/20/81	-1,762	The inventory difference is due to the recovery of material during the disassembly and cleanup of a facility ventilating system.
		HEU	09/21/81	-1,528	The inventory difference is partially due to an enrichment change from the blending of enriched operating material from an incinerator.
		HEU	11/16/81	-365	The inventory difference falls within the applicable regulatory limit.
General Electric, Wilmington, NC	SNM-1097	LEU	08/10/81	6,940	The inventory difference falls within the applicable regulatory limit.
Nuclear Fuel Services, Erwin, TN	SNM-124	LEU	11/18/81	-5,556	The inventory difference falls within the applicable regulatory limit.
		HEU	07/29/81	5,688	The inventory difference falls within the applicable regulatory limit.
		HEU	09/30/81	-760	The inventory difference falls within the applicable regulatory limit.
		HEU	12/02/81	-2,393	The inventory difference falls within the applicable regulatory limit.

Licensee	License No.	Material Type	Inventory Date	Inventory Difference (Grams U-235)	Explanation
Rockwell, Canoga Park, CA	SNM-21	HEU	01/05/81	-270	The inventory difference falls within the applicable regulatory limit.
		HEU	03/02/81	207	The inventory difference falls within the applicable regulatory limit.
		HEU	05/04/81	72	The inventory difference falls within the applicable regulatory limit.
		HEU	06/29/81	-135	The inventory difference falls within the applicable regulatory limit.
		HEU	08/31/81	148	The inventory difference falls within the applicable regulatory limit.
		HEU	11/03/81	-146	The inventory difference falls within the applicable regulatory limit.
Texas Instruments, Attleboro, MA	SNM-23	HEU	08/26/81	2	The inventory difference falls within the applicable regulatory limit.
		HEU	10/28/81	-6	The inventory difference falls within the applicable regulatory limit.
		HEU	12/16/81	0	The inventory difference falls within the applicable regulatory limit.
Union Carbide, Tuxedo, NY	SNM-639	HEU	07/01/81	-139	The inventory difference falls within the applicable regulatory limit.
		HEU	08/31/81	-40	The inventory difference falls within the applicable regulatory limit.
		HEU	10/28/81	-58	The inventory difference falls within the applicable regulatory limit.
		HEU	12/30/81	-123	The inventory difference falls within the applicable regulatory limit.

Licensee	License No.	Material Type	Inventory Date	Inventory Difference (Grams U-235)	Explanation
United Nuclear Corp. Montville, CT	SNM-368	HEU	07/15/81	-113	The inventory difference falls within the applicable regulatory limit.
		HEU	09/18/81	-188	The inventory difference falls within the applicable regulatory limit.
		HEU	11/20/81	541	The inventory difference falls within the applicable regulatory limit.
Westinghouse, Columbia, SC	SNM-1107	LEU	11/01/81	4,387	The inventory difference falls within the applicable regulatory limit.

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